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AN OVER-EXPRESSING HOMOLOGOUS ANTIGEN VACCINE  
AND A METHOD OF MAKING THE SAME

The invention described herein was made under a grant from the United States Department of Agriculture.

- 5 Therefore, the U.S. government may have certain rights in this invention.

The invention pertains to an over-expressing homologous antigen vaccine, a method of producing the same, and a method of using the vaccine for prophylaxis or treatment of a vertebrate suffering from or at risk from a pathogen. The vaccine is derived from an attenuated or avirulent version of the pathogen, and over-expresses one or more genes from the pathogen, thereby providing immunity greater than that induced by a vaccine of the same pathogen without over-expression of a gene.

Background of the Invention

- Vaccines are used to protect against diseases, which are caused by pathogens. These pathogens are microbial organisms, such as bacteria and viruses, which affect animals, including humans. Vaccines are primarily derived from a pathogen by producing and administering either: a) an attenuated or avirulent version of the pathogen; b) the killed pathogen; c) extracted protective antigens or antigen mixes of the pathogen (homologous antigens); or d) a micro-organism expressing one or more protective antigens encoded by



Patent  
Attorney's Docket No. 031786-046

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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Interim Patent Application of )

Stephen M. BOYLE et al. )

Application No.: 09/692,623 )

Filed: October 20, 2000 )

For: AN OVER-EXPRESSING )  
HOMOLOGOUS ANTIGEN )  
VACCINE AND A METHOD OF )  
MAKING THE SAME )

Group Art Unit: 1645 )

Examiner: Jennifer E. Graser )

Confirmation No.: 2200 )

#9/B  
JM  
8/6/02

REPLY AND AMENDMENT

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

In response to the Office Action mailed February 27, 2002, please amend the above-identified application as follows. A Petition for Extension of Time for two months to extend the period for response to July 29, 2002, is submitted herewith in a separate paper.

IN THE SPECIFICATION:

Please amend the Paragraph Beginning on Page 1, Line 1, as follows:

B1  
This application is a divisional of Application No. 09/091,521, filed June 19, 1998, now U.S. Patent 6,149,920 issued November 21, 2000, which is a national stage application of PCT/US97/23032 filed December 5, 1997.

complete protection, such as sterile immunity, against a challenge by the virulent pathogen.

It is a further object of the invention to provide a method of producing a vaccine which is an attenuated or avirulent pathogen over-expressing a homologous antigen, and immunizing an animal with the vaccine such that the vaccine causes over-expression of an homologous antigen and expression of a heterologous antigen, both of which provide protection against the virulent pathogen in the vaccinated subject.

It is yet a further object of this invention to provide an over-expressing homologous vaccine, a means for making such a vaccine and a method of using the vaccine for prophylaxis and treatment of Brucellosis in animals, especially bovine animals.

#### Brief Description of the Drawings

The attached figures are intended to aid in explaining and to more particularly point out the invention described herein. In particular:

Figure 1<sup>1A-1B</sup> is a diagram depicting the derivation of a homologous antigen from a *Brucella* species, and insertion of the antigen into a *Brucella* species vaccine strain;

Figure 2 depicts construction of recombinant plasmids for over-expression of copper/zinc SOD(A) and GroES and GroEL(B) in *B. abortus* strain RB51;

Figure 3 demonstrates the clearance of *B. abortus* strain 2308 from the spleens of mice vaccinated with *B.*